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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1964

MOORE TOWNSHIP (Corunna)

water pollution control plant

MOE
WPCP
MOO
1964
ATKF

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DIVISION OF PLANT OPERATIONS
Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Moore Local Advisory Committee,
Township of Moore.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Moore Township Water Pollution Control Plant, OWRC Project No. 61-S-88.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,

D. S. Caverly, P. Eng.,
General Manager

MOE
HPCP
1990
1964

ATKF

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Moore Township Water Pollution Control Plant, OWRC Project No. 61-S-88 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B C Palmer

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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MOORE TOWNSHIP

(CORUNNA)

water pollution control plant

operated for

THE TOWNSHIP OF MOORE

by the

ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. Beattie
Operations Engineer: P. J. Osmond

801 Bay Street — Toronto 5

'64 REVIEW

The average daily flow for the year was 87,500 gallons and represents 27% of the design capacity of the plant. This flow allowed one tank of the aeration section to be used for aeration purposes and the other tank to be used as an aerobic digester.

The raw sewage had an average strength of 203 ppm BOD and 208 ppm SS. The resulting final effluent had an average BOD of 11 ppm and SS of 25 ppm resulting in reductions of 94.5% and 88% respectively. An average of 3 cubic feet of grit was removed per million gallons of sewage.

The final effluent was chlorinated from June to the end of October. In December year-round chlorination of the final effluent was commenced.

The one year construction maintenance period expired in October. A complete inspection was made of the project and covered project equipment, structures and grounds. Several deficiencies were noted and were corrected by the contractor. A total of 88 hours was spent by the head office technical staff at the project during the year in making inspections and in assisting the Chief Operator.

An inspection was made of the complete sanitary sewer system during the summer. No problems were reported at the time.

The total operating cost for 1964 was $10,546.67. This represents a cost of $329.38 per million gallons treated.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY
1961 - 1964

INCEPTION

In 1961, following a request from the Police Village of Corunna, the Township of Moore in conjunction with the Ontario Water Resources Commission initiated plans for the construction of a sanitary sewer system and water pollution control facilities for the Police Village of Corunna.

James D. Nisbit, Consulting Engineer, Sarnia, was engaged to prepare plans and specifications for the project and worked in conjunction with the firm of James F. MacLaren Limited, Toronto, Ontario.

APPROVAL

In October 1962, the Township signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the project.

CONSTRUCTION

Keystone Contractors Limited, Windsor, began the construction of the sewers in October 1962 and Spier Borthers Limited, Sarnia, began the construction of the plant in November 1962. In October 1963 the Division of Plant Operations took over the operation.

TOTAL COST (ESTIMATED)

$765,000.



S. H. BECHARD
OPERATOR

Project Staff

COMMENTS

The Corunna plant is operated by a single operator. It is possible for one capable operator, with supervision and technical assistance from the OWRC head office staff to maintain and efficiently operate a project of this size. A part-time assistant is available when Mr. Bechard requires time off for holidays, sickness or attendance at training courses, or when additional assistance is necessary for inspecting and cleaning sewers.

Supervision of the plant is based on a total of 40 hours per week, 36 hours occurring during the period from Monday to Friday inclusive and two hours each on both Saturday and Sunday.

Description of Project

SEWER SYSTEM

The sewage is collected in a sanitary sewer system and flows by gravity to the treatment plant.

INFLUENT WORKS

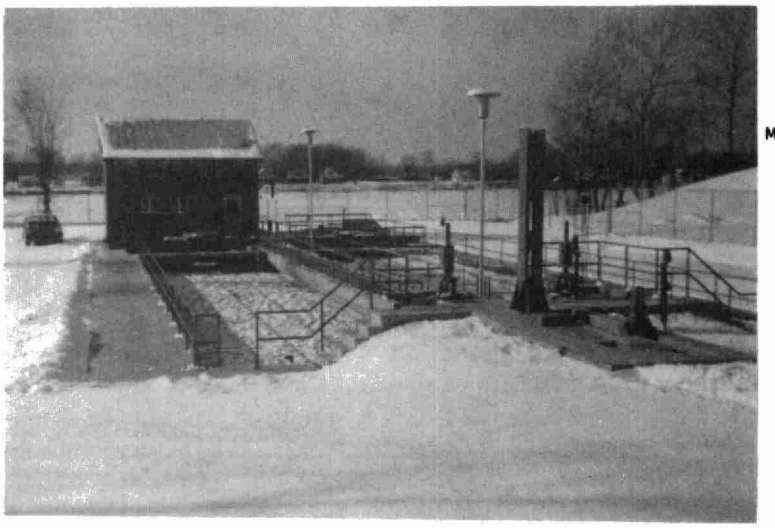
The sewage enters the plant through a 12 inch diameter sewer and passes through a comminutor which shreds the larger solids. A bypass channel equipped with a manually cleaned bar screen is used when the comminutor is not in operation.

GRIT REMOVAL AND AERATION

The flow from the influent works enters two rectangular concrete tanks. Each tank is baffled into two sections, a grit removal section and an aeration section. The velocity of flow is sufficiently reduced in the grit section to allow grit and sand to settle out into a hopper. The grit and sand are removed from the hopper by an air lift eductor which discharges the material onto a decanting platform from which it is manually removed. Flow than enters the aeration section where it is mixed with activated sludge returned from the final clarifiers. Activated sludge consists of biological communities of micro-organisms. The resulting mixture, or mixed liquor as it is called, is retained in the tank for a period of approximately 24 hours at design flow during which time it is mixed and aerated. This process involves the removal of soluble, colloidal and suspended materials from the sewage by biological oxidation. Compressed air which is discharged through air diffusers mounted along one side of each aeration tank supplies the oxygen for the process and also imparts a spiral flow pattern to the mixed liquor which prevents settling in the tanks.

FINAL CLARIFIERS

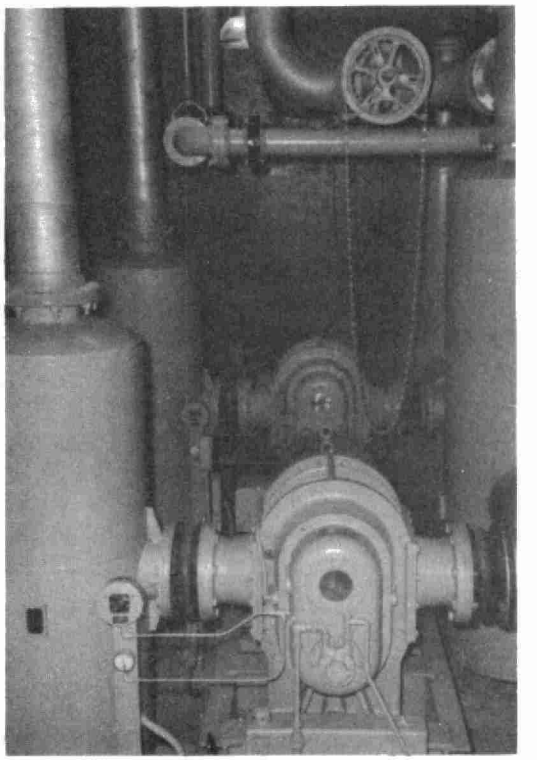
The aerated mixed liquor from the aeration tanks then flows to two final clarifiers which have a retention period of approximately 5.7 hours at design flow. This allows the activated sludge to seperate from the treated sewage and to settle to the bottom of the tank. It is collected by scraping mechanisms and then removed to the return sludge sump from which it can be returned to the aeration section or wasted to the sludge holding tank. The treated sewage flows over the weirs and into the final effluent channel header. A Parshall Flume located at the end of the channel measures the final effluent flow. Chlorine is added to the clear final effluent downstream of the Parshall Flume and the effluent is then discharged to the St. Clair River through an outfall sewer.



MAIN BUILDING AND AERATION TANKS



INFLUENT WORKS AND COMMINUTOR



AIR BLOWERS

PROJECT COSTS

LONG TERM DEBT: (Total Capital Cost)	$458,983.00

The total cost to the municipality during 1964 was as follows:

Net Operating	$ 10,546.67
Debt Retirement	9,299.00
Reserve	4,996.00
Interest Charged	26,790.64
TOTAL	$ 51,632.31

RESERVE ACCOUNT

Balance at January 1, 1964	$ -
Deposited by municipality	4,996.00
Interest Earned	103.50
	$ 5,099.50
Less Expenditures	-
Balance at December 1, 1964	$ 5,099.50

DEBT OUTSTANDING:	$449,491.26

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	774.80	326.82			296.75		35.30	101.78		14.15	
FEB	660.62	326.82			305.41		19.86			8.53	
MARCH	669.99	346.01			263.99		51.66			8.33	
APRIL	990.35	357.06			254.99		77.60	249.38	21.16	8.88	21.28
MAY	1028.85	535.59			241.33	44.33	75.92	73.96	(1.46)	59.18	
JUNE	873.13	356.42	36.00		237.76		34.19	87.67	81.00	8.88	31.21
JULY	845.04	357.06	64.80		247.86		47.97	37.62	81.00	8.73	
AUG	771.05	357.06	122.40		244.89		35.17			11.53	
SEPT	726.00	357.06			275.78		52.76			40.40	
OCT	924.31	357.06	9.00		287.06		44.99		162.00	8.83	55.37
NOV	686.84	357.06			316.60		4.75			8.43	
DEC	1595.69	535.59			608.58	267.46	26.89		101.00	21.56	34.61
TOTAL	10546.67	4569.61	232.20		3581.00	311.79	507.06	550.41	444.70	207.43	142.47

BRACKETS INDICATE CREDIT

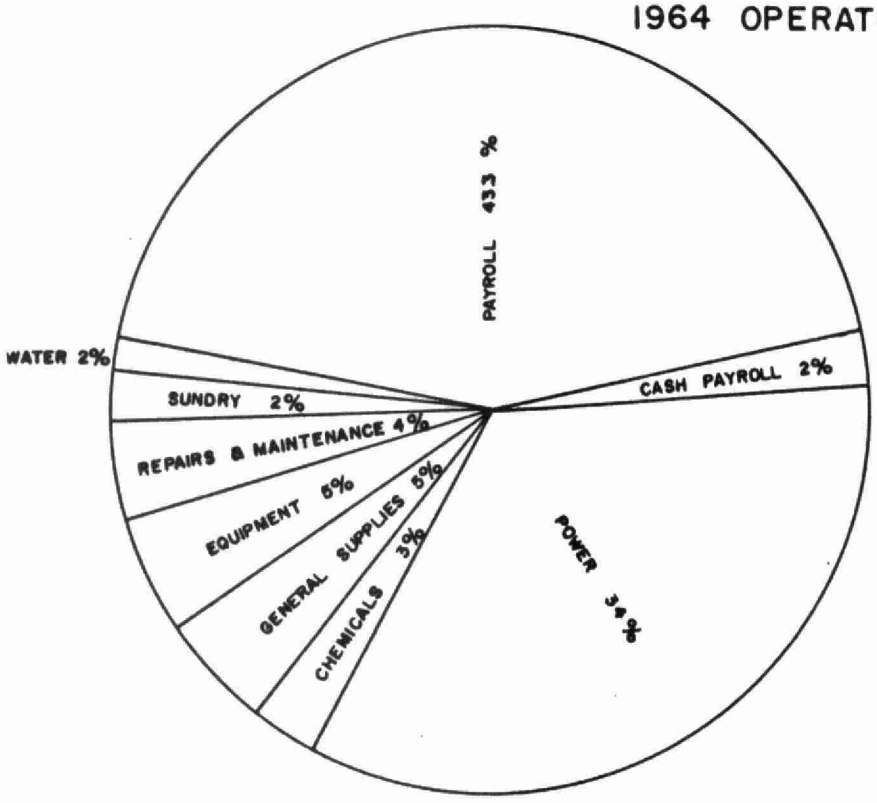
YEARLY COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1964	32.020	$10546.67	** $21.80	329.38	17 CENTS

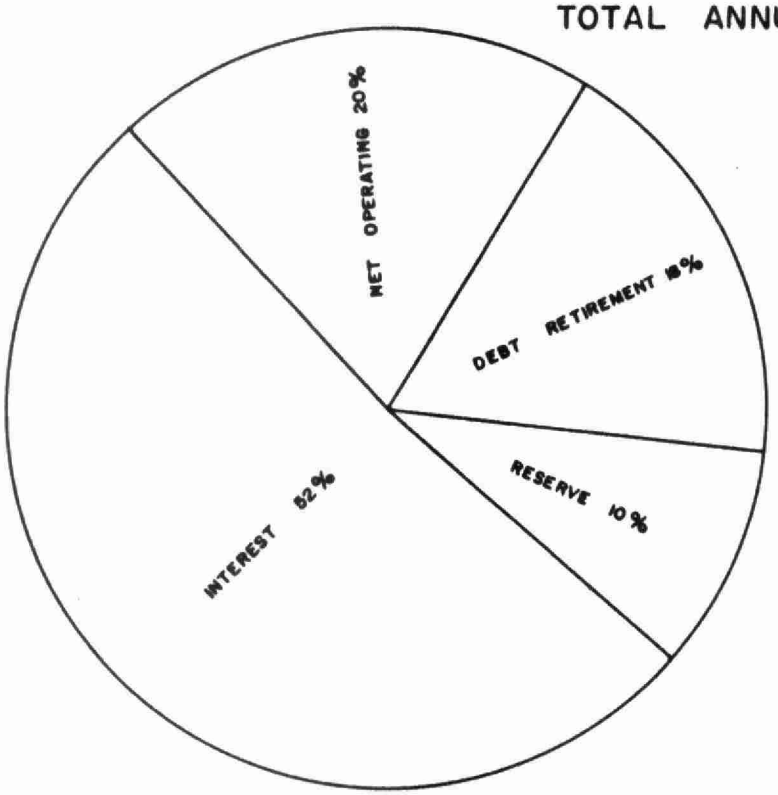
* PRORATED ON 9 MONTHS DATA

** BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS

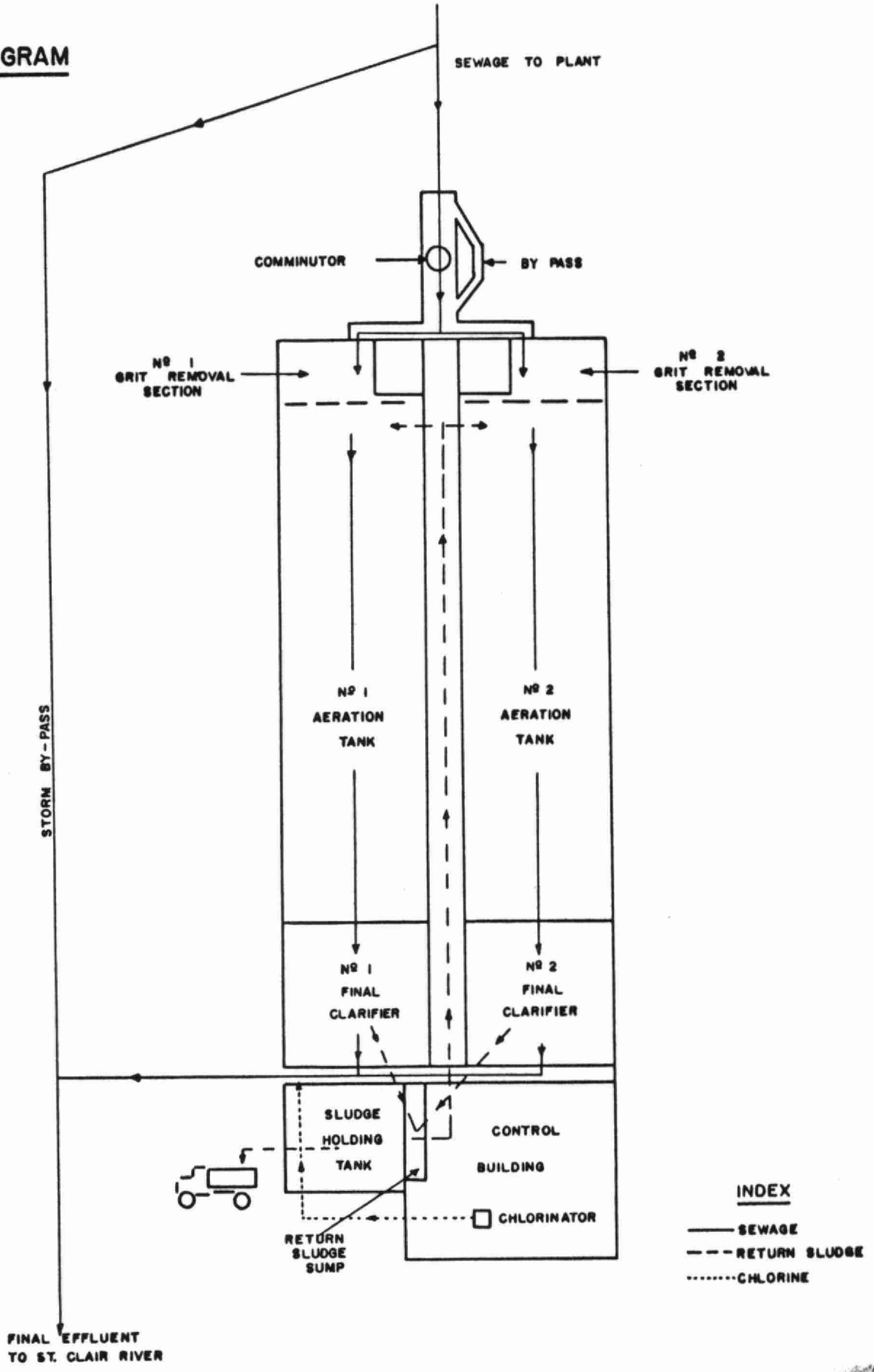


TOTAL ANNUAL COST



Technical Section

FLOW DIAGRAM



Design–Data

GENERAL

Type of Plant - Extended Aeration

Design Population - 4,000 persons

Per Capita Flow - 80 gpd

Design Plant Flow - 320,000 gpd

Five Day BOD

Raw Sewage - 150 ppm

Removal - 90-95%

Suspended Solids

Raw Sewage - 150 ppm

Removal - 90-95%

Influent Sewer

12 - inch diameter, gravity flow

Screening

Bypass channel equipped with a manually cleaned bar screen with one inch c to c spacing.

Comminution

1 - Model 15-C-4 comminutor as manufactured by Worthington Corporation.

GRIT REMOVAL

2 - Aer-Degritter systems as manufactured by Chicago Pump utilizing a portion of the aeration tanks. Detention - 17 minutes. Each system equipped with a 4 inch diameter air lift eductor with a capacity of 100 gpm and a manually cleaned decanting platform.

AERATION TANKS

2 - Rectangular concrete tanks, each 85.0 ft. x 22.0 ft. x 14.25 ft. (average liquid depth). Total volume is 51,907 cu. ft. of which 607 cu. ft. is used for grit tanks. Detention period is 24 hours at design flow assuming no return sludge.

AIR DIFFUSERS

A fixed header pipe at the bottom of each tank is equipped with 22 Chicago Pump Sparjers with teflon inserts. There are four jets per diffuser. Sparjers are placed at 20 inch centres and are capable of diffusing 10 to 20 cu. ft. per minute.

AIR SUPPLY

2 - 'Sutorbilt" size 10 x 11 Series 3200 air blowers each having a capacity of 1000 cfm @ 7.0 psi. Each blower is driven by a 50 hp Tamper electric motor,

FOAM CONTROL

A spray water system with one Smart-Turner Horizontal non-clog pump having a capacity of 125 gpm @ 100 ft. head and powered by a 10 hp. General Electric motor.

FINAL SETTLING TANKS

2 - Square concrete tanks each 22.0 ft. x 22.0 ft. x 12.50 ft. (liquid depth). Total volume 12,000 cu. ft. Detention period at design flow is 5.7 hours Surface settling rate is 330 gallons per sq. ft. of tank per day. Weir overflow rate is 2350 gals. per lin. ft. of weir per day Each tank is equipped with a rotary plough Squarex Type "AZ" collector as manufactured by Dorr-Oliver-Long Limited.

RETURN SLUDGE PUMPS

No. 1 - Smart Turner horizontal non-clog pump with a capacity of 0 - 333 gpm @ 25 ft. head driven by a 5 hp U. S. Varidrive motor.

No. 2 - Smart Turner horizontal non-clog pump with a capacity of 33 gpm @ 25 ft. head and driven by a 5 hp General Electric motor.

CHLORINATION

1 - Wallace and Tiernan Model A-741 manually controlled chlorinator capable of chlorinating at a rate of 100 pounds of chlorine per 24 hours. 150 pound cylinders are used. There is no chlorine contact chamber since there is sufficient detention in the outfall sewer.

SLUDGE HOLDING TANK

One 17.0 ft. x 17.0 ft. x 15.0 ft. deep tank having a volume of 23,000 gallons (assuming a 12.8 ft. sludge depth). Corresponding to 0.93 cu. ft. per capita.

FLOW MEASUREMENT

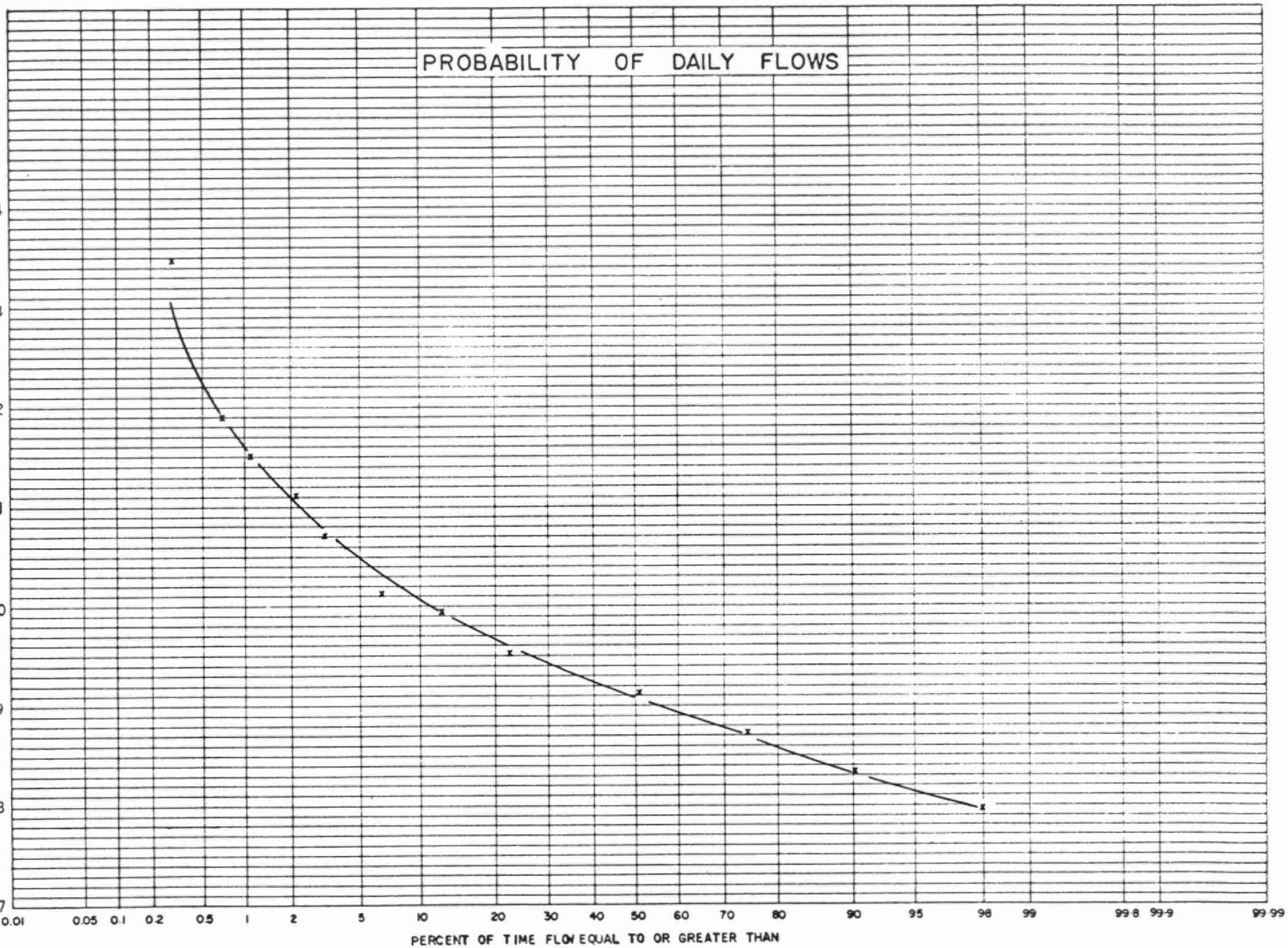
A 6 inch Parshall Flume located in the final effluent channel.

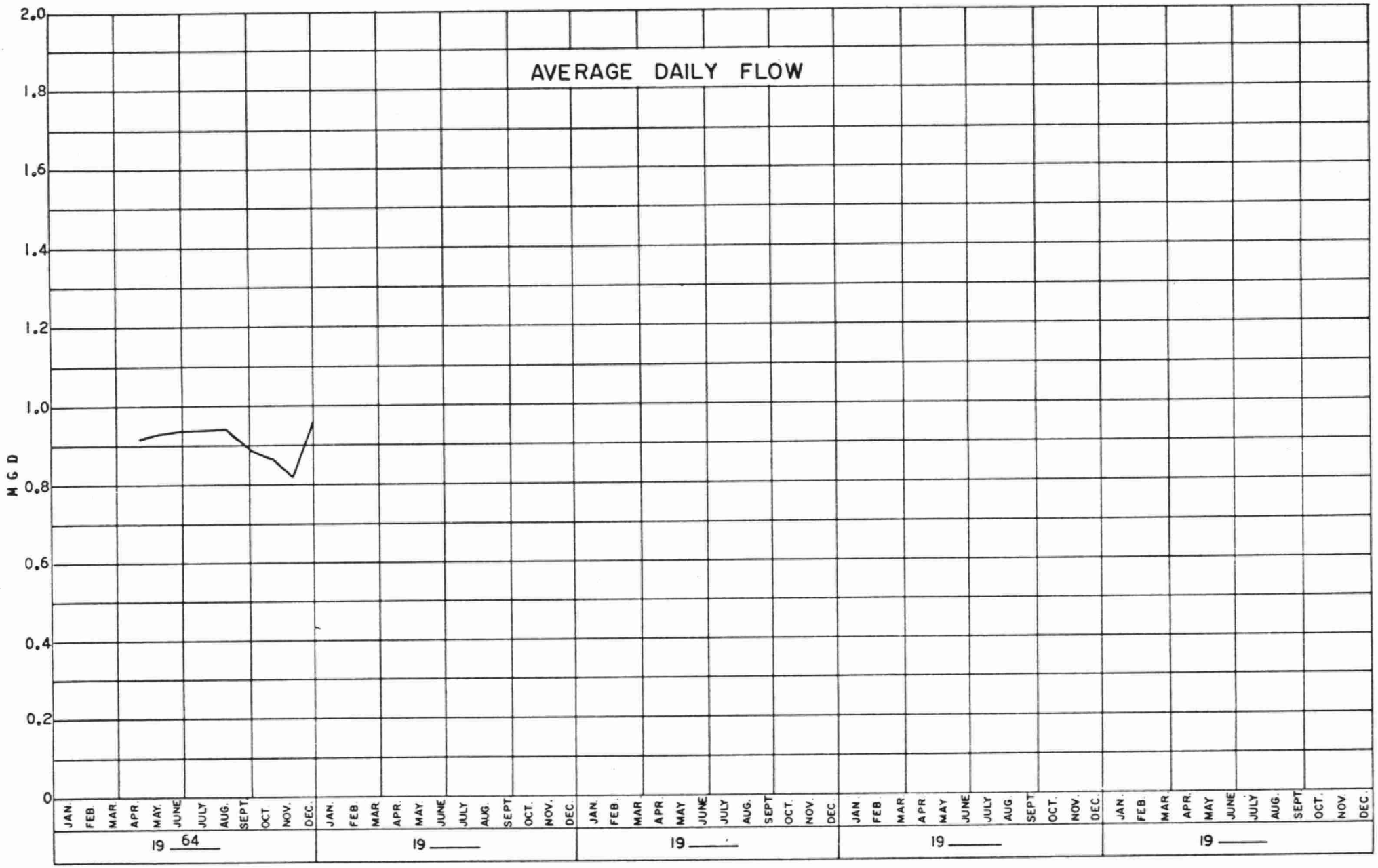
OUTFALL SEWER

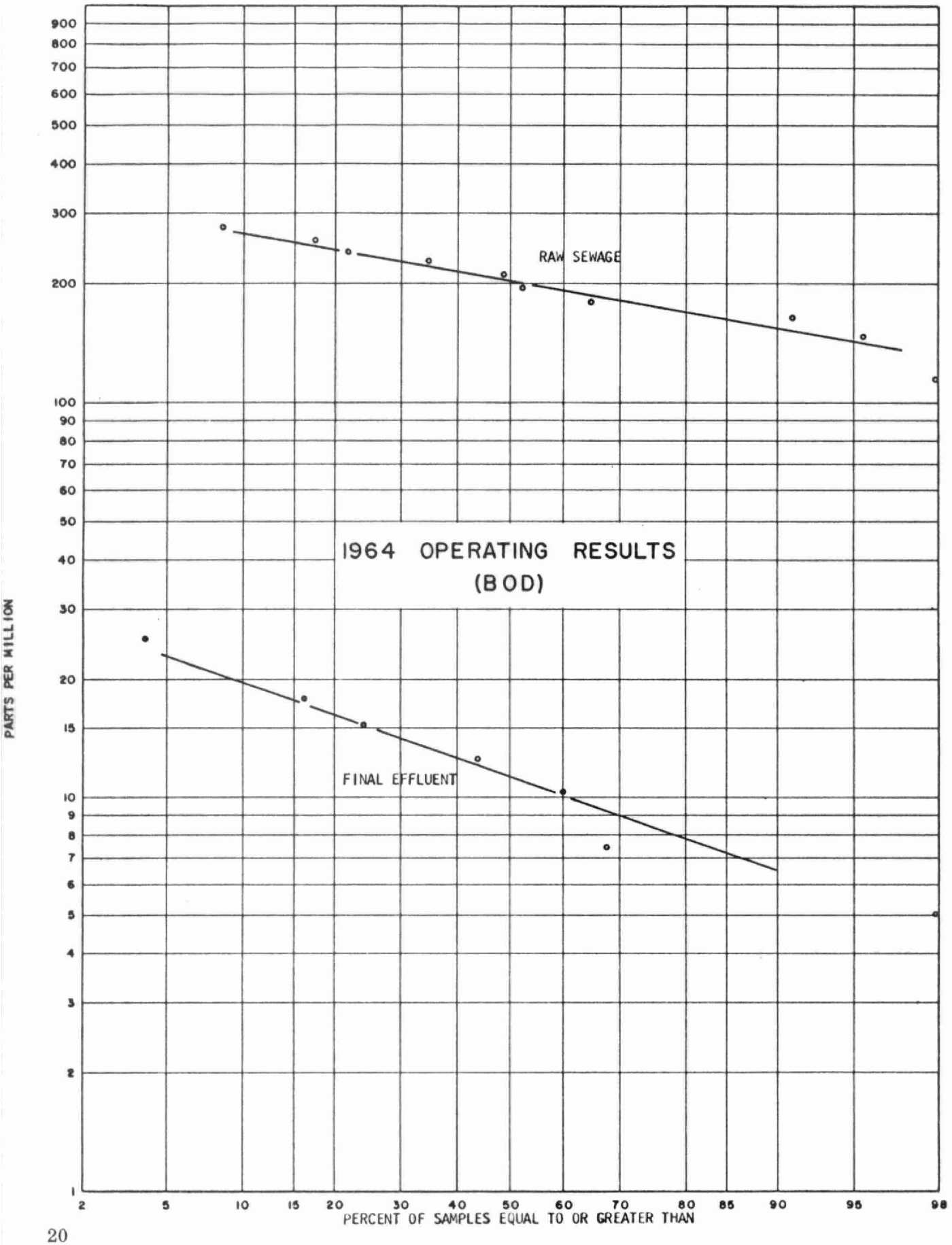
One 48 inch diameter corrugated metal pipe - 196 feet long.

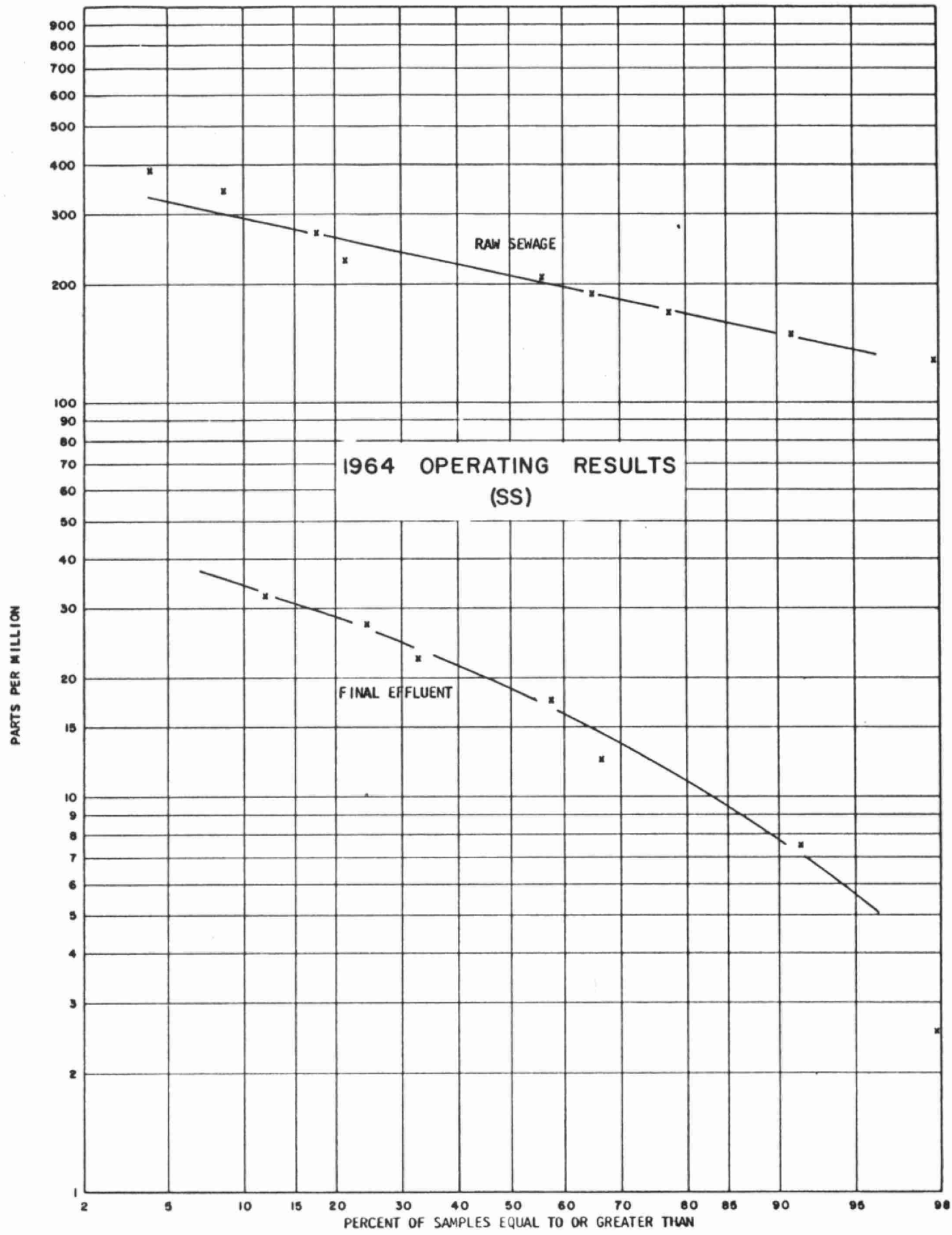
Process Data

A total of 32.020 million gallons of sewage were treated at the plant in 1964 which represents an average daily flow of 87,500 million gallons, or 27% of the design capacity of the plant. The maximum average daily flow for a month occurred in December when the flow was 94,600 gallons per day and represents 30% of the design capacity.

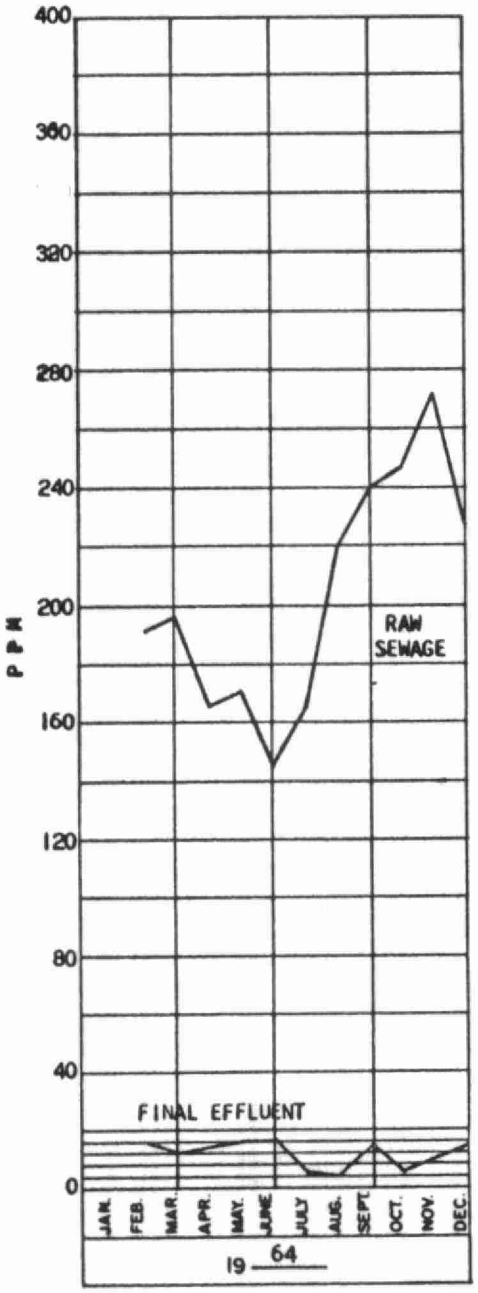

PROBABILITY OF DAILY FLOWS
.14
.13
.12
.11
.10
.09
.08
.07
M G D
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOW
MGD
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT OCT. NOV. DEC.
19 64
19 ____
19 ____
19 ____
19 ____

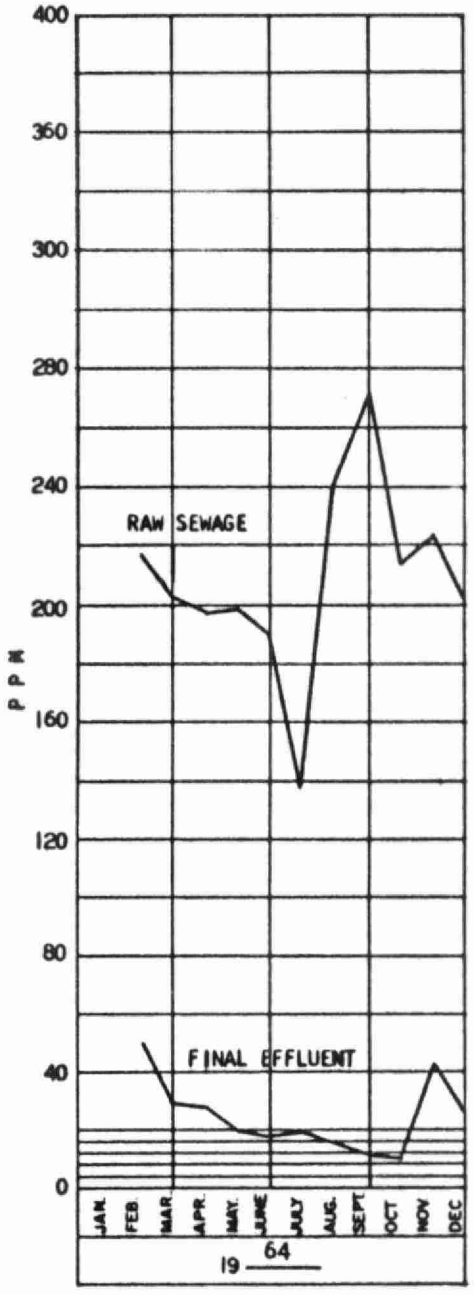

1964 OPERATING RESULTS
(BOD)
RAW SEWAGE
FINAL EFFLUENT
PARTS PER MILLION
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN


1964 OPERATING RESULTS
(SS)
RAW SEWAGE
FINAL EFFLUENT
PARTS PER MILLION
PERCENT OF SAMPLES EQUAL TO OR GREATER THAN
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
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4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98

MONTHLY VARIATIONS



Biochemical Oxygen Demand



Suspended Solids

GRIT, B.O.D AND S.S. REMOVAL

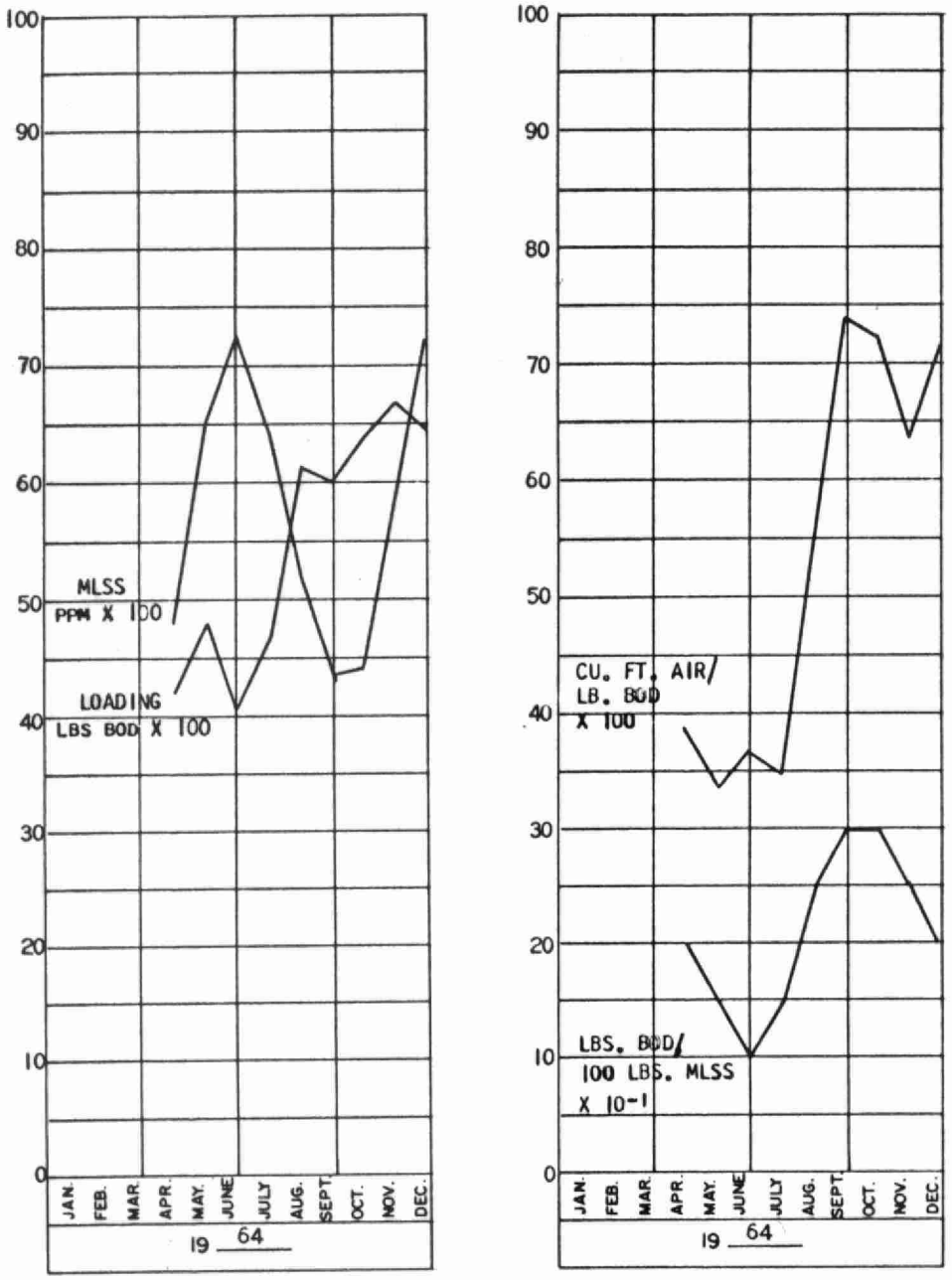
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	(A) 203	11	94.5	(B) 2.44	(A) 208	25	88.0	(B) 2.33	
FEB.	190	16	91.5	(B) 2.06	216	50	77.0	(B) 1.97	
MAR.	195	12	94.0	(B) 2.32	202	29	85.5	(B) 2.20	
APR.	165	14	91.5	2.02	198	28	86.0	2.28	4
MAY	170	15	91.0	2.18	199	20	90.0	2.53	10
JUNE	145	5.7	96.0	1.92	190	17	91.0	2.40	6
JULY	165	4.4	97.5	2.30	137	19	86.0	1.70	6
AUG.	218	14	93.5	2.92	243	16	93.5	3.26	8.5
SEPT.	238	6.1	97.5	3.01	273	12	95.5	3.34	9
OCT.	247	10	96.0	3.11	212	11	95.0	2.64	8
NOV.	272	14	95.0	3.40	222	42	81.0	2.17	9.5
DEC.	225	8.8	96.0	3.18	200	27	86.5	2.54	10
TOTAL				30.86				29.36	* 71
AVG.	203	11	94.5	2.57	208	25	88.0	2.45	8

* nine months' data.
(a) average values substituted.
(b) loading computed on prorated flow.

COMMENTS

The average strength of the raw sewage for the year was 203 ppm BOD and 208 ppm SS. The final effluent had an average BOD of 11 ppm and SS of 25 ppm which resulted in an average reduction of 94.5% and 88.0% respectively. The final effluent BOD met the Ontario Water Resources Commission standard of 15 ppm 75% of the time and the SS standard of 15 ppm 35% of the time.

The average grit removal was 8 cu. ft. per month or 3 cu. ft. per million gallons.



AERATION TANK DATA

MONTH	PRIM. EFFL * B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. B.O.D. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY				
FEBRUARY	190			
MARCH	195			
APRIL	165	4800	2.0	3860
MAY	170	6500	1.5	3380
JUNE	145	7270	1.0	3660
JULY	165	6423	1.5	3470
AUGUST	218	5176	2.5	5440
SEPTEMBER	238	4354	3.0	7400
OCTOBER	247	4426	3.0	7250
NOVEMBER	272	5817	2.5	6350
DECEMBER	225	7207	2.0	7180
TOTAL				
AVERAGE	203	5517	2.0	

* Raw - aeration figures - no primaries.

AERATION SECTION

In 1964, only one aeration tank was used for aeration since the flows to the plant were less than half the design capacity. For the first seven months the blowers were operated on an on-off basis with timers since then full capacity was not required. However, problems were experienced with the plugging of diffusers during the off cycle and it was found that 24 hour operation of the blowers was necessary. It was therefore decided to use the second tank as an aerobic digester and have the excess air supplied to it. After the change no further problems were experienced with the diffusers.

The average strength of the raw sewage into the aeration tank was 203 ppm BOD which resulted in an average loading of 2 pound BOD per 100 pound MLSS. The average MLSS was 5517 ppm.

During the first 7 months approximately 3500 cu. ft. of air was supplied per pound of BOD removed and after the blowers were put on a 24 hour basis approximately 7000 cu. ft. were supplied of which approximately 30% went to the aerobic digester. This high quantity was due to operation requirements rather than process requirements.

Activated sludge was wasted to the holding tank where it was decanted and the sludge then was pumped to the aerobic digester. No sludge was hauled in 1964.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	* 2.535		
FEBRUARY	* 2.375		
MARCH	* 2.535		
APRIL	2.680		
MAY	2.825		
JUNE	2.760	(a) 63.0	6.8
JULY	2.870	(b) 82.5	6.9
AUGUST	2.860	201.5	7.0
SEPTEMBER	2.600	196.5	7.6
OCTOBER	2.630	236.0	8.9
NOVEMBER	2.415		
DECEMBER	2.935	(c)199.0	7.3
TOTAL	32.020	978.5	
AVERAGE	2.668		7.4

*prorated on average value of 0.0875 mgd. (a) 10 days (b) 13 days (c) 29 days.

COMMENTS

The final effluent was disinfected with chlorine from June 12 to October 31. However, on a recommendation from the Sanitary Engineering Division year-round chlorination was initiated on December 3. A total of 978.5 pounds of chlorine was used during the year at an average dosage of 7.4 ppm to maintain a chlorine residual of 0.5 ppm in the final effluent.

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CONCLUSIONS

The plant operated at 27% of capacity and has sufficient capacity to handle the present flows. The plant provided a good treatment resulting in a final effluent which met the OWRC standard for BOD most of the time, but was slightly above the standard for SS. A higher quantity of air than normal was required to prevent the plugging up of diffusers. As the flow to the plant increases a more efficient use of the air will occur.

The project was well maintained and operated during the year.

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